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feet. The newly enthroned peak is named Mount Clarke. The upper limit of trees upon it is 5900 feet. Above 6500 feet patches of snow are found on the lee side of the main range, at 6500 feet.

AMERICA.—*Science* states that several expeditions to Alaska are projected during the coming season. Gen. Miles, who commands in the military district, desires to acquire a knowledge of Cook's inlet and the Tananah course and watershed, and it is hoped that a party under Lieut. Ray will be sent for the purpose. The party under Lieut. Abercrombie were unable to pass beyond the glacier alleged to obstruct the Copper or Atna river, about sixty miles from the sea. A party under Lieut. Allen left for the Copper river, June 30, and hope to cross the divide between that river and the Yukon basin and descend the latter. Lieut. Stoney is reported to have a new expedition nearly organized to continue his investigations of the Kowak river.

EUROPE.—M. Rabot has explored Lake Enara and the valleys of the Pasvig and Talom, in Finland. The country is an immense forest, with lakes and peat bogs scattered everywhere, and the only means of communication is by rivers which abound in cascades and rapids. Lake Enara, drained by the Pasvig, is a veritable inland sea, with hundreds of islets covered with magnificent pine trees. The country around it, level and little broken, forms a depression between the plateau of Finmark and the hills of Russian Lapland.

#### GEOLOGY AND PALÆONTOLOGY.

THE ORIGIN OF FRESH-WATER FAUNAS.—Professor W. J. Sollas gives to the world, in No. v, Vol. III, of the Scientific Transactions of the Royal Dublin Society a review of the causes which have originated and limited the fresh-water faunæ of the world. Three causes are admitted as proven: (1) the difference in chemical composition of the medium; (2) the severe character of the fresh-water climate; (3) the necessity for the suppression of a free larval existence. Although the first cause is doubtless a powerful one, it is not sufficient to alone account for the facts, as seems to have been too generally assumed, for in three months Beudant brought several species of marine mollusks to live in fresh water, and, though he failed with three species out of fifteen, it is probable that an unfailing supply of appropriate food and greater slowness in change of medium are the only conditions essential to the success of such experiments. Von Martens (*Ann. and Mag. Nat. History*, 1858) was the first to call attention to the climatic extremes suffered by animals resident in fresh water. Freezing limits them in the colder zones, while, though the populousness of the fresh waters increases towards the tropics, partial desiccation is a hindrance there. Yet, were the want of saltness

and the severity of the climate the only obstacles, we might expect that many more of the forms which crowd the coasts would work their way up the rivers. As a rule, however, the fresh-water forms are quite distinct from the marine, retain their distinctness everywhere, and, in time, are well marked as far back as the Mesozoic. It is therefore probable that the fact that the majority of marine invertebrata are diffused by means of free-swimming larvæ has been one of the chief obstacles to their spread up the rivers. These fragile and feeble larvæ always swim along with even an ocean current, and are utterly powerless to stem that of a river. Should a slow-moving marine animal succeed in ascending some distance up a stream, its larvæ, if free-moving, would infallibly be carried out to sea. By a detailed examination of the forms which inhabit fresh water, Professor Sollas shows that in most of them the free larval stages are suppressed. Other causes may exist. Thus the absence of suitable food is sufficient to account for the lack of carnivorous gastropods and cephalopods in the rivers.

Fresh-water animals may be converted into marine in three ways: (1) by direct migration; (2) by the conversion of the area they inhabit into a fresh-water basin or lake; (3) by adaptation to a terrestrial or marsh-loving habitat, and subsequent exchange of this for a fluvial or lacustrine one. The first method can scarcely occur with fixed forms, unless they are parasitic upon locomotive animals. Some prawns and crabs appear to have thus immigrated by compliance with the three conditions, but the instances are very few. The wide changes in the distribution of land and water that have taken place in the course of geological time offer a more probable mode of the gradual transformation of a fauna from a marine to a fresh-water one. The comparative poverty of the latter may be due to the escape of some species, as well as to the extinction of others. The earliest lakes known are of the Devonian period, and one Devonian fossil at least, *Anodonta jukesii*, has been found. Helicidæ are found in the coal measures, and are probably the ancestors of the Limnæidæ. In the Lias and Oölite numerous fresh-water mollusks occur, and *Cyrena*, *Neritina* and *Hydrobia* probably date from the Trias. Several genera of fresh-water mollusks were already distributed over parts of the Palæarctic, Nearctic and Oriental regions in Cretaceous times. The Tertiary lakes of the northern hemisphere have suffered from a glacial era, and the Caspian has become unwholesome by concentration of its waters, yet it retains a relic of a Tertiary fauna; while the Central African lakes have a remarkable assemblage of Mollusca.

No marine mollusk is known to pass through a "glochidium" stage, like that of the Unionidæ; no marine Polyzoön or sponge produces statoblasts; no marine Phyllopod an ephippium; and no Tubularian an egg in a horny shell like that of *Hydra*. All

these are modifications suffered by fresh-water genera, are not shared by their marine relatives, and appear to be necessary to the existence of sedentary forms, as characteristic of fresh-water organisms. The wide distribution of a form introduced by floating timber is not probable until its developmental history has changed also.

THE BATRACHIA<sup>1</sup> OF THE PERMIAN BEDS OF BOHEMIA, AND THE LABYRINTHODONT FROM THE BIJORI GROUP (INDIA).<sup>2</sup>—In these contributions we find important additions by eminent palæontologists to the knowledge of the stegocephalous Batrachia of the regions named. In Dr. Fritsch's volume we have the continuation of an extensive work which we have noticed at various times in the *NATURALIST* as the successive parts appeared. We have to add, on this occasion, our renewed commendation of the care and detail with which Dr. Fritsch continues to develop the subject, and our praise for the admirable plates which accompany the text. The species treated of are those which belong to the larger forms of the Rhachitomi, together with some of the intermediate types, such as the *Dendrerpetonidæ*. Of the greatest interest are two new genera of the order Embolomeri, *Chelydosaurus* and *Sphenosaurus*, where the additional vertebral centrum, entire in the type of the order (*Cricotus*), is divided into three segments, two lateral and an inferior. This is a curious discovery, especially as *Sphenosaurus* has hitherto been regarded as a reptile.<sup>3</sup> It also has an important bearing on the value of the order Embolomeri, which Dr. Fritsch is disposed (p. 4) to question. He thinks that the embolomeric vertebral structure is confined to the caudal region in the genus *Cricotus*, although I have figured it in the lumbar and cervical region of that genus, and described it as found in the dorsal<sup>4</sup> region. Dr. Fritsch reached this conclusion because he finds that in *Archegosaurus* the caudal region is embolomeric, and the dorsal region rhachitomous. His discovery of the persistence of the embolomeric condition in the dorsal region of *Chelydosaurus* and *Sphenosaurus* might have suggested to him the correctness of my observations on *Cricotus*. I add here that in *Eryops*, in which the dorsal vertebræ are rhachitomous, the caudal vertebræ are not embolomeric. So *Archegosaurus* stands alone in this respect. This determination of the characters of *Archegosaurus* by Dr. Fritsch is very useful to American palæontologists, as it has hitherto been very imperfectly described. I have stated that there are vertebræ of this type

<sup>1</sup> Fauna der Gaskohle in d. Kalksteinen d. Permformation Böhmens. Von Dr. Anton Fritsch, B. II, Heft 1; Praag, 1885.

<sup>2</sup> The Labyrinthodont from the Bijori group. By R. Lydekker, Mem. Geological Survey of India, Ser. IV, Vol. I, 1885.

<sup>3</sup> These two genera should form a second family of the Embolomeri, characterized as above, which I call the Sphenosauridæ.

<sup>4</sup> Proceedings Amer. Philosoph. Society, 1884, p. 29.

from Leybach in the museum of Princeton College, New Jersey. As they agree exactly with Dr. Fritsch's figures of *Archegosaurus*, it is difficult to perceive why he denies the accuracy of my statement in the matter (p. 15).

Both the authors here reviewed have evidently been more or less influenced by Mr. Miall's system of the Stegocephalous Batrachia—Dr. Fritsch adopting his names and Mr. Lydekker using his characters in defining his genera. We cannot but think that the publication of this system was a misfortune to the progress of the subject. The characters of the relative position of the eyes and nostrils and the outline of the skull are certainly only specific characters, and the veriest tyro in the study of recent Batrachia would not use them for generic characters, still less for family characters, as is done by Mr. Miall.

Dr. Lydekker's paper introduces an undoubted member of the order Rhachitomi to the Indian Permian fauna, and devotes his usual care to the description and illustration of it. Unfortunately the skull of the single specimen at his disposal has lost the bones of its superior face, so that many of the characters of the species and genus remain unknown. The latter, indeed, to which is given the barbarous name *Gwandanosaurus*, is not so defined as to be distinguishable from some of those already known. In view of its possibly turning out to be identical with some of these, Dr. Lydekker remarks that he relies on the spirit of the following rule of the International Geological Congress of Bologna "in favor of his own name," *i. e.*, "In future for specific names priority shall not be irrevocably acquired unless the species shall have been not only described but figured." This is a doctrine which if allowed, will be adopted very much on the principle of whose "ox is gored," and will work unfavorably at times against a good many names of Dr. Lydekker's. A proper knowledge of the subject, and skill in systematic analysis, while never rendering illustrations unnecessary, are much more important than they to the real advancement of science.

Examples of the disregard of the law of priority in this paper are seen in the proposition that the name *Actinodontidæ* supersede *Eryopidæ* of prior date, and the use of the term *hypocentrum* for *intercentrum* of prior date. This we hold to be simply creating confusion, and causing much inconvenience to the student.<sup>1</sup> Moreover, Dr. Lydekker has not read the paper which he quotes. He states (p. 7) that the *intercentrum* of Cope is the *pleurocentrum* of Gaudry, and the *centrum* of Cope is the *hypocentrum* of Gaudry. The fact is the reverse. The *intercentrum* was renamed *hypocentrum* by Gaudry, and the *centrum* of Cope

<sup>1</sup> The same untenable method is evinced in Dr. Lydekker's rejection of the name *Creodonta* (1875), and the proposition to use in its stead the inconvenient expression "*Carnivora primigenia*" (Catalogue of Fossil Mammalia in British Museum, 1885, p. 20).

was called pleurocentrum by Gaudry. I have since adopted the latter term as a convenience, though this is not always true of the multiplication of names.—*E. D. Cope*.

THE GENERA OF THE DINOCERATA.—Professor Marsh's work on this order of mammals, just issued, supplies some important data as to the characters of some of the species described by him. I can now discriminate more clearly the generic characters, which are, I think, as follows :

- Four bilobed symphyseal teeth on each side; inferior canine teeth not enlarged; inferior premolars three.....*Loxolophodon* Cope.
- Four symphyseal teeth on each side, at least some of which are not bilobed; inferior canine larger than incisors; four inferior premolars, the first and second separated by a diastema.....*Bathyopsis* Cope.
- Four subequal (? bilobed) symphyseal teeth on each side; inferior premolars four (teste Marsh).....*Ditetrodon* Cope.
- Two or three subequal symphyseal teeth on each side; three inferior premolars.....*Uintatherium* Leidy.
- No inferior canines or incisors; three inferior premolars.....*Tetheopsis* Cope.

Most of the known species belong to *Loxolophodon*, each of the remaining four genera having but one species each. *Loxolophodon* includes as synonymes the names *Dinoceras* and *Tinoceras* Marsh, which were proposed as nomina nuda after *Loxolophodon*, and were not characterized until several years later. It is uncertain whether *Eobasileus*, which was proposed and defined at about the same time as *Loxolophodon* is distinct from it or not. *Octotomus* is also a synonyme. *Ditetrodon* is established on *Uintatherium segne* Marsh, and *Tetheopsis* on *Tinoceras stenops* Marsh.—*E. D. Cope*.

THE UNITED STATES GEOLOGICAL SURVEY.—In an article upon the organization and plan of the United States Geological Survey, published in the *American Journal of Science*, Mr. J. W. Powell states that, where the topography and geology are simple, as in the prairies and great plains, the sheets of the United States survey map are made on a scale of 1-250,000, or about four miles to the inch; while farther west, where both structure and topography are more complex, special districts are made to twice this scale, and important mining districts are drawn much larger. In the less densely populated portions of the eastern part of the United States, a scale of 1-125,000 is used, but the more densely populated portions are drawn to twice this scale, or about one mile to the inch. The whole of the United States and Alaska will, upon this plan, require not less than 2600 sheets; besides several hundred special maps. With the present organization, the map of the United States will be completed in about twenty-four years. About one-fifth of the United States (Alaska excluded) has hitherto been mapped.

INSECTS OF THE CARBONIFEROUS PERIOD.—The recent discoveries of Mr. Charles Brougniart in the insect fauna of Commen-

try, France, have thrown a flood of light over the obscurities of the Carboniferous epoch. Wings of a type which all writers had agreed were at any rate neuropterous, and referred to a special genus, *Dictyoneura*, are found by him attached to bodies which are clearly orthopterous, and of a specialized group, which one would scarcely have looked for in ancient times. Additional species now occur from time to time, and the number of forms referred to *Dictyoneura* is constantly growing. Others allied to them have been referred, and are still being referred, to other genera, and to still other divisions of Neuroptera.

Under these circumstances, and because a number of new American types need to be brought into their proper place, I have thought best to offer a brief synopsis of those Carboniferous forms heretofore discovered (with a few additional ones from this continent), which may be referred to the ancient Phasmida.

Among them will be found nearly all the species heretofore referred to the Termitina from the European coal measures, for a careful study shows that the white ants were not at all represented in Palæozoic times, so far as the forms yet discovered show. Most of those which have been considered Termitina belong rather here (they have already in several instances been referred here), while others belong to other groups of Neuroptera than Termitina.—*S. H. Scudder, in Proceeds. Amer. Acad. Arts and Sciences.*

GEOLOGICAL NEWS.—*General.*—The Boletín Acad. Nac. de Ciencias de Córdoba contains two articles by L. Brackebusch upon the geology of the province of Jujuy. Except for the information gathered in 1876 by Lorentz and Hyeronimus, and some notes on the primordial fauna by E. Kayser, this northern part of the Argentine Republic has hitherto been geologically unknown. The south-eastern part of the province, near the Vermejo, is comparatively low though even here the Sierra of St. Barbara rises west of the Rio S. Francisco to 3000 meters. The larger central and western portion is entirely a mountain land, range after range rising to heights of from 4500 to 5500 meters, separated by valleys, some of which are basin-like depressions, 30–60<sup>km.</sup> broad. This western part is sterile, while the east is highly fertile. The mountains of Jujuy have a closer relation to the Bolivian plateau than to the chains of the center and west of the Argentine provinces. The most western chains (Sierras de la Puna) consist principally of clay slates, alternating with grauwacke, and, save in one locality, are without fossils. The easterly Sierra de Chuni consists of slates, grauwacke and sandstones, the last rich in Silurian fossils, graptolites, trilobites, cephalopods and brachiopods. Newer formations occur in the basins between the mountains, gypsum-bearing sandstone, dolomite, limestone, oolite and bituminous shales, etc. Fish and insect remains have been found in the Sierra St. Barbara. Strata corresponding to those which

d'Orbigny referred to the triassic in Bolivia are by Brackebusch placed in the Wealden or Neocomian. In these Mesozoic strata occur many petroleum springs, and throughout Jujuy and Salta, in Bolivia, and probably below the diluvium of the Gran Chaco, the character of the formation is such that Brackebusch styles it the "petroliferous formation." A small basin near Jujuy has Post-tertiary strata, with beds of lignite and mastodon remains. Eruptive rocks occur in many localities, and gold ore is found in the beds of the streams which flow from the Sierra Cabalonga.

—Part I of the "Grand Atlas of the Second Geological Survey of Pennsylvania," with fifty sheets imperial folio, has been published at Harrisburg.—The two "Prix Vaillant" of the Academie des Sciences de Paris have been given, the first to M. Gustave Cotteau, for his researches among fossil echinoderms; the second to M. Emile Riviere for his work in prehistoric anthropology. M. Cotteau has published more than 1000 plates of echinoderms; and for thirty years has been known as a palæontologist. The results of the researches of M. Riviere have been published in a work entitled "L'antiquité de l'homme dans les Alpes Maritimes."—M. Dieulafoy is now engaged in studying the deposits of iron, manganese and zinc which exist around the "Plateau central," in the Cevennes particularly. He arrives at the conclusion that these deposits are derived from the primordial rocks from which they were extracted by the action of sea water.—A. W. Waters has described more fossil cheilostomatous Polyzoa from South Australia. Of the 220 species now described in the series of papers, about half are still living. The species noticed in this paper are seventy-three in number. Attention was called to the fact that, though the shape and nature of the zoecial avicularia are characters of the greatest value, yet their presence or absence cannot be made a specific distinction, as there are a large number of cases where specimens are found with none or only a few such avicularia, whereas on other specimens of the same species they may occur abundantly.

#### MINERALOGY AND PETROGRAPHY.<sup>1</sup>

PHYSICAL MINERALOGY.—*Cohesion*.—It has long been known that, aside from directions of minimum cohesion (true cleavage) in crystals there are certain planes in which a slipping of the molecules takes place with especial ease. These are called by the Germans "*Gleitflächen*," and to our knowledge of them a considerable series of papers by Mügge has largely contributed. This writer concludes that the "*Gleitflächen*" coincide with the cohesion maxima along which the molecules can be parted only with the greatest difficulty, while they may be made to slip or slide over each other as easily in this as in any other direction. The

<sup>1</sup> Edited by Dr. GEO. H. WILLIAMS, of the Johns Hopkins University, Baltimore, Md.